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In Memory of
William Barton Rogers
Boston, 1882.

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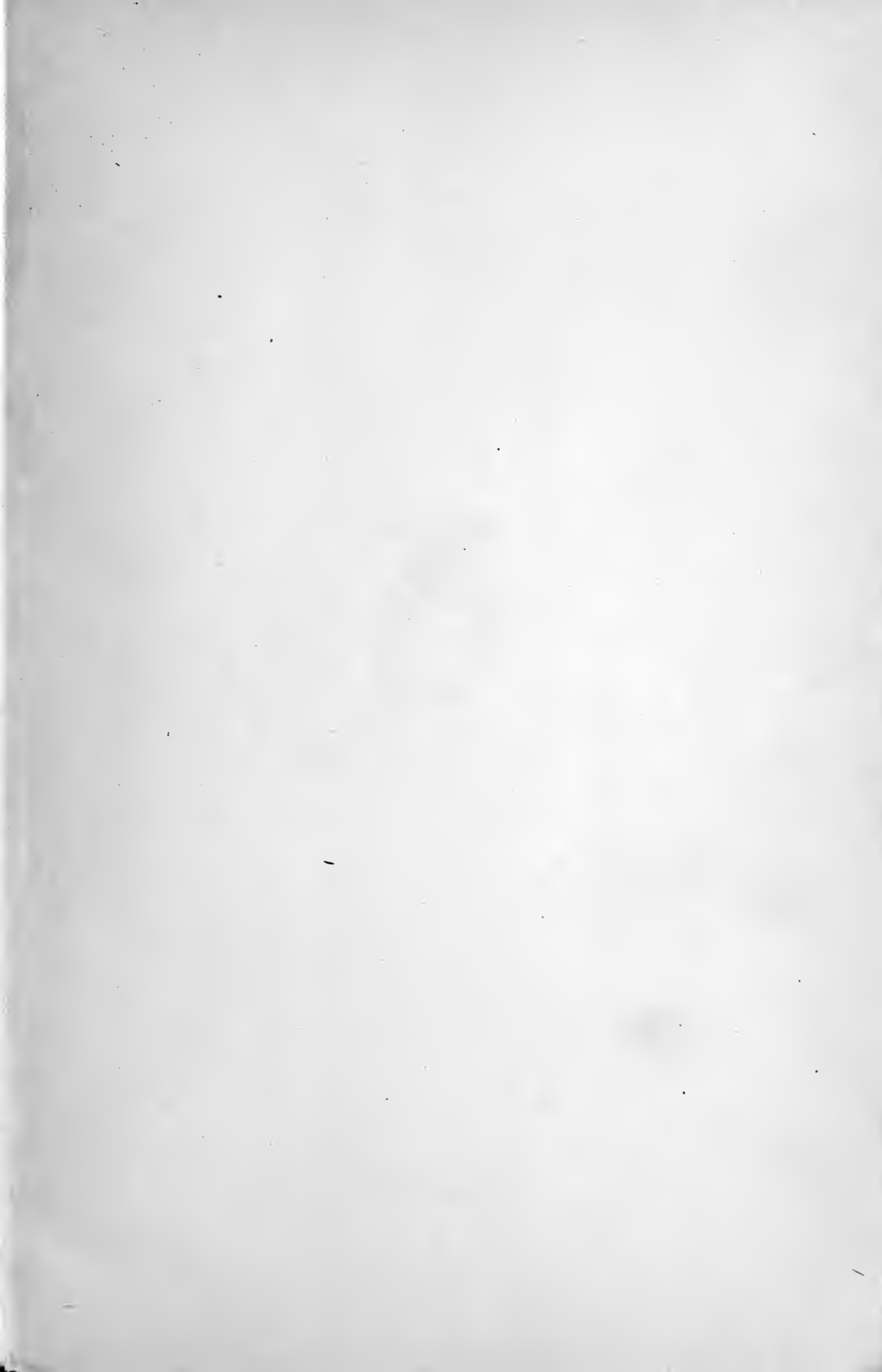
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SOCIETY OF ARTS,
OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

288TH MEETING: OCT. 12, 1882.

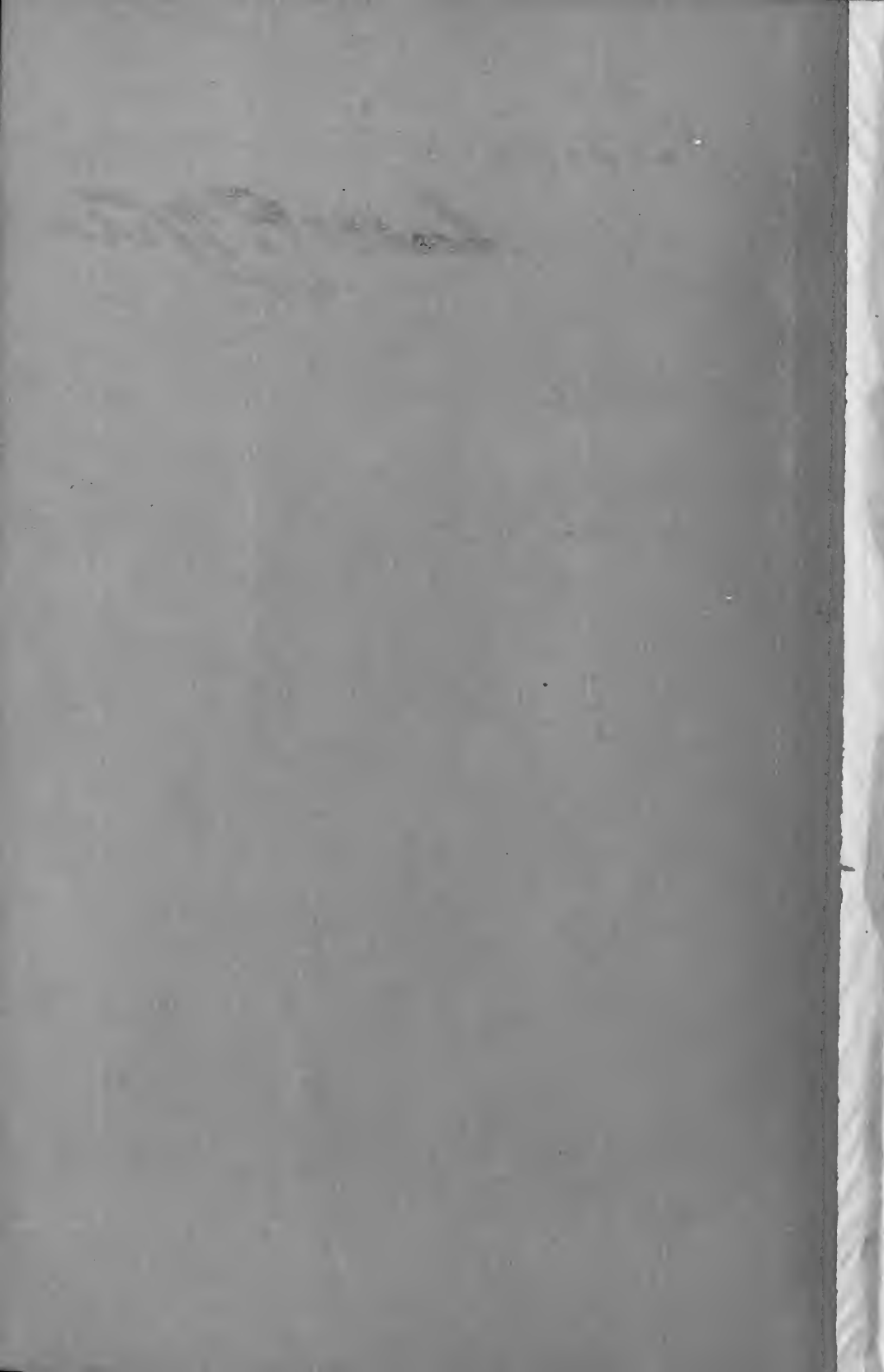
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IN MEMORY OF

WILLIAM BARTON ROGERS, LL.D.

LATE PRESIDENT OF THE SOCIETY.

BOSTON: 1882.



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MEMORIAL MEETING.

It was deemed fitting that at its first meeting of the season the SOCIETY OF ARTS should formally recognize the loss of its honored and beloved founder

WILLIAM BARTON ROGERS, LL.D.,

who died suddenly in Huntington Hall, on May 30th, 1882, while making an address at the graduating exercises of the class of 1882 of the Institute of Technology.

The meeting of October 12th was therefore held as a memorial meeting, that expression might be given to the love and admiration which, by his noble character and rare powers of mind, Professor Rogers won from all about him. The meeting was called to order by President Francis A. Walker.

President WALKER said: Ladies and Gentlemen,— We have tonight assembled together to commemorate the life and scientific work of Professor William B. Rogers, who a little less than a year ago in this hall relinquished the position of president of the Society of Arts, which he had so long held. The relation of the Society to its retiring president was a peculiar one, so peculiar as to be almost unique. It was not that he was the Society's first president, that he was its founder, that to his conception the Society owed its existence; there was more than this in the parting between Professor Rogers and the Society of Arts. From the first he had been in a high sense its life and soul. Mind and heart he had been wholly devoted to its interests. He had watched over its growth, had labored for its advancement in scope and influence, and had devoted to it all the energies of one of

the rarest and richest minds which this country or the larger and older world of science has ever known. Nobly endowed with various gifts, he had at once the power of rigid investigation, of luminous exposition, and of philosophic eloquence, each in a degree uncommon among men of science, and perhaps never before so happily combined in any one person. He was, indeed, a man who could enter no community without attracting instant attention and commanding universal admiration,—a man who could fall out of no community without creating a wide and lasting void.

But perhaps it was in a society like this that the purity of his nature, the extent and variety of his acquirements and accomplishments, and the richness of his intellectual gifts were to be most fully known and felt. It was not my privilege to attend the meetings of this association while Professor Rogers presided over them, but in the meetings of another body, the National Academy of Sciences, I have had reason to know how truly admirable he was as the presiding officer of a learned society; how suggestive and inspiring were his brief introductions of scientific themes; how apt and conclusive and satisfactory his summing-up of the facts and arguments adduced. Certainly, if any man, Professor Rogers knew how to give an introduction that introduced. He did not, like many presiding officers, proud of their knowledge and fond of display, anticipate the subjects to be presented in such a manner that perhaps diffident and embarrassed speakers felt that the interest of their audience had been exhausted in advance; such egotism was wholly foreign to the generous soul of him we mourn. In altogether another spirit, when Professor Rogers introduced a speaker, he wooed for him in advance the attention of the audience, aroused their interest in the subject, and prepared the way for its presentation. And when the paper was read and the discussion closed, shall we ever forget what a glow, as of poesy and romance, his fervid eloquence—eloquence such as no man since Chalmers has possessed—threw over and around even the most dull and difficult among the subjects of scientific investigation! For to Professor Rogers the truth was always beautiful, and the most solid and substantial structure of scientific principle stood in his view against an evening sky radiant with a light which no brush of painter could portray.

It is appropriate that this, the first meeting of the Society since

the death of Professor Rogers, should be devoted to a commemoration of his life and his scientific work. On behalf of the executive committee of the Society, Prof. William P. Atkinson will offer resolutions in reference to this event.

Professor ATKINSON then read the following resolutions : —

Resolved: That, by the death of Professor Rogers, the country lost a man whose rare abilities, and whose single-hearted devotion, through a long life, to the pursuit of scientific truth, place his name on that short list of American men of science who have distinctly raised the credit of the American nation in the eyes of the scientific world.

Resolved: That to him, more than any other man the founder and organizer of the Massachusetts Institute of Technology, the State and the City owe a deep debt of gratitude for the accomplishment of a most difficult task, the successful establishment of a new institution of learning to meet a new and pressing educational want in the community; and that we who have been associated with him, or who, as members of this Society, have had the opportunity of knowing the difficulties with which the enterprise was surrounded, desire to put on record our appreciation of his patience, his courage, his sagacity, his comprehensive and far-reaching views of the true aim and purpose of the institution, of the earnestness and self-sacrifice with which he devoted himself to the work, and the generosity with which he gave his time, his means, his thought, and finally his life to its successful accomplishment.

Resolved: That, through his long career as a teacher, President Rogers, by his varied gifts, his accurate and extensive knowledge, and his admirably trained power of scientific exposition, exhibited in the highest degree those qualities which give success and add lustre to a profession in which, of all others, this country needs, if it is to reach its true rank in the intellectual world, such gifts and such devotion as he exhibited.

Resolved: That in his death this Society has lost not only a respected presiding officer but a man who, through the simplicity as well as the dignity of his character, through his constant courtesy and his unaffected kindness of heart, endeared himself to all of us who had the happiness of his acquaintance as an honored and beloved personal friend.

Mr. President, I do not intend to support these resolutions with any extended remarks, for there are others here who are much better able to do so than I am. Although by the death of Professor Rogers I am left the senior instructor in our institution, and, with one exception, the one who has been longest connected with it, yet Professor Runkle has been connected with it from the very beginning, and can speak with more intimate knowledge of all Professor Rogers's plans and purposes than I can. I shall leave it to Professor Cross to speak of him as a teacher of science, and to the President of our Alumni to speak of his relations with our students. And we have with us this evening—and I am sure we are all happy to have him with us—a gentleman from Professor Rogers's native State, who was connected with him in scientific work, and who can tell us much of the debt Virginia and the whole country owe to his early and untiring scientific labors.

When I think of Professor Rogers, I can think of him only or chiefly as a personal friend. In the beginning, at the outset of our enterprise, I came in as a perfect stranger to him. My position, like that of all of us here, was full of difficulties in organizing such an entirely new institution, on entirely new plans, and I can speak, if anybody can, of Professor Rogers's uniform kindness and uniform courtesy.

He saw, and appreciated, and sympathized with us in all the difficulties under which we labored; and I believe if we had not had a man as wise, as kind, as faithful, as far-seeing as Professor Rogers was that this institution would never have reached the point of success in which we rejoice today. He, of all men, was fitted by his mental and moral qualities to undertake the pilotage of a new institution like this in the stormy waters which it must perforce pass over before it reaches success. I have known Professor Rogers intimately in personal acquaintance, for he made me his personal friend; I have visited him in his beautiful and happy home; and I can testify to every word that anyone can utter as to his warm-heartedness, and his excellence. In his character he was a man to be loved; in his studies and in his teaching he was a man to be imitated. He could not be satisfied until he had found the truth, and uttered it. He not only had that enthusiasm for science which made him a discoverer, he had that love of imparting it which made him a teacher. Add to

this that he was always in sympathy with the young. His warm-heartedness went out to his pupils; and when we combine these qualities, that admirable gift for scientific investigation which he had by nature, and that untiring pursuit of and love for truth, with his wonderful capacity as an expositor, and with his warm personal sympathies, it seems to me we have almost the ideal of a scientific teacher, and the elements of an eminently happy and successful life.

Mr. President, without further remarks I offer to you these resolutions.

Mr. JAMES P. TOLMAN, president of the Alumni Association of the Institute, then said: Mr. President,—In seconding the resolutions which have just been presented, I esteem it a privilege to be permitted to refer to the relations which the students in the school of this Institute have entertained toward our dear friend. A feeling of warm personal loyalty was inspired in the minds of all who received direct instruction from him. I am a member of the earliest class that identifies itself by the legend, "Graduate of the School of the Massachusetts Institute of Technology." In those early days when we occupied narrow quarters in Summer street the numbers of instructors and of students were both small enough to permit an intercourse impossible in the later days of large classes and many teachers. If we did not then have the advantages that now accrue from special libraries and finished apparatus; if the courses of instruction were incomplete and uncertain, the students being the subjects for experiment, as well as objects for teaching; if we were so unequal in preparation for our work that the time of many must often be sacrificed to the needs of the few; still I question if our intimate relations with the professors, and the spirit which grew from direct association with them, did not largely compensate for the shortcomings of our course.

Professor Rogers was always the student's friend. The lack of means and the immense amount of work assumed by the instructors sometimes caused implied promises to go unfulfilled, and inspired the restless pupils — a good proportion of whom were grown men, taking time for study from the practice of their professions — to feel rebellious against the direction of the school. I remember that some of these occasions resulted in visits to President Rogers, and that such was the invariable courtesy with which these complainants were

treated, that we always came away feeling that, in so far as the means would allow, every need of the classes should be filled, and with our sense of manliness so appealed to that we were ready to recognize our duty as co-workers with the professors for the good of the School. For fifteen years I have carried the impression — now only an impression, with the details forgotten — left by one of these meetings, in which the sweetness and sympathy of the professor entirely changed the attitude of the rebellious company, and sent us away allies instead of opponents.

I also love to recall his aid given in the selection of a subject for the graduating thesis. This included, in my case, references to the writings of himself and others, the selection and discussion of geological specimens, and, finally, practical hints for the camping trip incident to gathering my information; so that I became thoroughly grounded in the feeling that I was actually conducting an original investigation, to be of real scientific value, and not merely performing the perfunctory task of complying with the formalities of the regulations.

In one of my school vacations I was fortunate enough to cross the ocean in the same steamer with President Rogers. And again I had warm testimony of his interest in the progress of the students. He frequently called my attention to passing objects of moment, and drew my notice to such subjects as the temperature of the water, the navigation of the ship, the geology of the Irish coast; and I find in my old letters a reference to his delight in a glorious sunset, and his discoursing on the beautiful play of clouds around a full moon. The loveliness of his spirit, expressed through the wonderful charm of his manner, makes of these recollections, which read like mere commonplace civilities, a storehouse of affectionate regard, and endears him to me much beyond any warrant of his official relations.

As an instructor Professor Rogers always came to his classes with his lectures thoroughly prepared. I cannot recall any instance of his appearing without his plan for the session being entirely matured, or any suggestion of his having felt his way in the arrangement of his course. He generally had the blackboards filled with copious notes, written by himself, thus greatly taxing his physical strength. His absorption in his subject made him almost impatient of the restraint imposed by models and apparatus, and at times

interfered with the smoothness of the experiments which he had always carefully prepared, and which were so lucidly explained that ocular demonstration seemed superfluous. He almost always introduced illustrations referring to other branches of science than that in particular discussion; and thus greatly contributed not only to the profound respect entertained toward his own accomplishments, but also to the stock of general information of the student, which is so much to be desired in a technical education.

This fact, that he always visibly led his pupils, and never seemed in any manner to lean upon them, aided largely in the development of that discipleship of feeling which was so characteristic of the relation of his classes toward him.

But it was not alone the earlier students who loved him. My meetings with later classes have been frequent enough to let me learn that even where there was none of that personal intercourse which was the great advantage of the beginning days, he was always known as the students' best friend.

The welfare of the graduates was his willing task, and after the days of his enfeebled age came upon him, he cheerfully gave whole evenings of his time to their entertainment, and to hearing their plans, advising upon their future, and sympathizing in their trials.

He came at great personal sacrifice of ease to the meetings of our Alumni Association, and always spoke with the same fervor which characterized his dealing with subjects of scientific interest. This enthusiasm of his, this urging the graduates on to stirring endeavor in their professions, this complimenting them on their achievements, contributed very largely to the solidity of the Association. And the statement that he was expected to be present and address the meeting was a magical aid in securing attendance from those graduates whose absorption in their work might often have prevented their remembering the connections which had moulded their advancement.

We gladly believe that the happiness of the students, as well as the successful organization of the Institute, was an appreciable element in the interest and energy with which he worked for, and the satisfaction he expressed in, the selection of his successor.

The PRESIDENT — You have heard the resolutions which have been offered by Professor Atkinson and seconded by Mr. Tolman. If they rightly and justly express your sentiments on this occasion,

will you please manifest it by saying "Aye." [The Society responded by saying "Aye."] It is a vote.

Ladies and Gentlemen,—When the theme is the great and manifold labors of Professor Rogers, the struggle against obstacles that might have depressed the sturdiest heart, the unceasing efforts, even amid weariness and pain, who should tell the story but his companion, trusted and tried in the time of difficulty and of doubt, in the day of small things, and of meetings in an upper chamber; when faith in the right and trust in the truth were to those unfaltering fellow-laborers "the substance of things hoped for, the evidence of things not seen"?

Dr. Runkle needs, under this roof, no introduction as he rises to speak of Professor Rogers.

Dr. RUNKLE said: Mr. President and Fellow-members of the Society of Arts,—After the lapse of twenty years we miss, and shall hereafter miss, the presence of him who, by common consent, must be regarded as the founder of the Massachusetts Institute of Technology. It is indeed true that many others have aided in bringing the Institute to the high place it now holds as an educational power in this country, but all have simply entered into his labors. His spirit and work have been the vitalizing and shaping forces, and these have been so potent that all who have come within their influence have been brought into harmonious relations. It is in this broad and comprehensive sense that Professor William B. Rogers is the founder of this Institute. But we do not meet tonight to mourn, but rather to gather strength and new devotion to duty in the contemplation of a life so nobly lived and so grandly ended. I trust that you will not consider the few brief and entirely inadequate words which I have to offer in relation to the last and crowning work of his life as the measure of my regard and affection, but simply as my contribution to the wreath of laurel which we, as a Society, tonight lovingly and loyally lay upon his grave.

It seems to be a law of nature that when the time is ripe for an onward and upward step in the progress of humanity the needed man appears. Within the memory of many who now hear me, and particularly after the financial depression of 1857, this country seemed to enter upon a new career of industrial prosperity and progress. This stimulus was also felt in renewed attention to the

problem of education. With the exception perhaps of the Rensselaer polytechnic school at Troy, N. Y., no systematic and persistent attempt had been made in this country to build up an education based on the modern languages with the mathematical, physical, and natural sciences in their relations to the industrial wants and progress of the country. A few colleges had feebly responded to the growing public demand by establishing scientific courses, so called, which proved but little more than cities of refuge for those too idle or too incompetent to follow the regular classical curriculum. Such, in brief, was the condition of the educational problem, and the attitude of the public mind, when the attention of Professor Rogers was called anew to it, in connection with suggestions that certain portions of this Back Bay should be devoted to public, and particularly to educational, uses.

The thought which naturally suggests itself is, what constituted his peculiar fitness to undertake the solution of this important problem? First, clearly, his early and thorough training in the physical and natural sciences; second, his great capacity and success as an investigator in so many and widely different fields, and his almost unrivalled powers as a teacher; and, lastly, absolute public confidence in his personal character, and in the unselfishness of his motives. I regret that time will not permit me to make free use of an excellent biographical sketch, to be found in *Popular Science Monthly* for September, 1876, for a full account of his early life and scientific labors; but I am sure that you will pardon a short quotation which we, who have so often heard him in this place and elsewhere, can fully appreciate. The writer says: "At the semi-centennial of the University of Virginia, he was the central object, on whom were fixed the eyes and hearts of the great concourse there assembled from all parts of the country. At the dinner of the alumni, he addressed them in a speech of half an hour. It was a wonderful specimen of eloquence. The old students beheld before them the same William B. Rogers who, thirty-five years before, had held them spell-bound in his class of natural philosophy; and as the great orator warmed up, these men forgot their age; they were again young, and showed their enthusiasm as wildly as when in days of yore, enraptured by his eloquence, they made the lecture-room of the University ring with their applause. Such was the effect produced by the off-

hand words of this distinguished man of science and unrivalled orator ; and those who have heard him in his moments of inspiration will not wonder at the account we have given."

Some years ago one of his old students at the University of Virginia, William LeRoy Brown, now president of the Alabama Agricultural and Mechanical College, gave me a glowing account of his lectures on astronomy. He said : " Every seat, window, and foot of floor space was filled, and the professor with difficulty made his way to his lecture table, where he found hardly sufficient room for himself. Other lecture-rooms were deserted, and the effect was such as only the highest oratory can produce."

We can imagine the effect. His vivid imagination, tempered only by the severe logic of scientific induction, ranging and grasping the universe, is only surpassed by his unrivalled powers of expression and description. The celestial scenery is depicted on the canvass in colors of living light. The heavenly hosts march in majestic procession before our exalted gaze, and we forget that we are not in the immediate presence of the living reality.

Professor Rogers made Boston his permanent residence in 1853. During the few following years he delivered two or more courses of Lowell lectures, which gave to the citizens of Boston and vicinity an opportunity to become acquainted with his marvellous power as an exact and graphic expositor of scientific facts and methods. We come now to the time when he was to enter upon the last and crowning work of his life. This work I shall briefly consider in connection with six principal documents. I think they will show that the idea of building up such an institution as this was a growth, and did not spring forth from his mind, Minerva-like, in its full development. It was the result of years of patient study and reflection ; and this accounts for two remarkable facts. First, its adaptation to the public need ; and, second, that after so many years of experience the general plan has needed almost no modification. The six documents are :—

I. Massachusetts Legislature. House document, No. 260, dated March 30, 1859.

II. Memorial of the committee of associated institutions of science and art. House document, No. 13, dated January, 1860.

III. Objects and plan of an institute of technology ; including a society of arts, a museum of arts, and a school of industrial science.

Read by Professor Rogers at a meeting held at the rooms of the Board of Trade, October 5, 1860.

IV. An account of the proceedings preliminary to the organization of the Massachusetts Institute of Technology; with a list of the members thus far associated, and an appendix containing petitions and resolutions in aid of the objects of the committee of Associated Institutions of Science and Art.

V. An act of the General Court granting the charter, and a square of land, two-thirds to the Institute of Technology, and one-third to the Boston Society of Natural History, approved April 10, 1861.

VI. Scope and plan of the school of industrial science of the Massachusetts Institute of Technology, as reported by the committee on instruction of the Institute, and adopted by the government May 30, 1864.

Document No. I contains the first evidence I find of Professor Rogers's interest in the plan to establish on the Back Bay "various institutions for the public benefit," which in the aggregate would constitute and might be known as the Massachusetts Conservatory of Art and Science. This document contains a memorial to the legislature, and the report of the joint special committee to whom the memorial was referred. The name of Professor Rogers only appears as a member of the memorial committee; but it is not difficult, I think, to see his hand both in the memorial and in the report of the committee. The memorial simply asks the State to reserve from sale certain portions of the Back Bay lands for the use of such public institutions as may associate together for the public good. It groups various scientific and industrial institutions under four sections, and proposes that each section shall occupy one square of the reserved land, the object of classification being to locate kindred institutions in such close proximity that they may coöperate in the erection of buildings and in other ways for the common good.

Section I might be devoted to collections of implements, models, and other objects pertaining to agriculture, horticulture, and pomology.

Section II, to natural history, practical geology, and chemistry, with ample room for museums of specimens.

Section III, to those institutions devoted to the development of mechanics, manufactures, and commerce.

Section IV, to fine arts, history, and ethnology.

The space reserved for each section should be ample for these and all institutions of a kindred character which the progress of the State may develop.

Such is the substance of the memorial, and the report of the joint committee is a carefully and ably drawn argument in favor of granting the land asked for, but closes by saying that the time is not propitious, and requests to be discharged from further consideration of the subject. To my mind the wisdom of this plan of reserving land on the Back Bay has been fully demonstrated by subsequent events, no matter by whom it was first suggested; and as time passes its failure of full realization will be the more deeply regretted. It would have been a powerful stimulus to the philanthropic of all classes and tastes, and in the light of today, after twenty-three years, we can see how grand the conception was. The concentration of public educational institutions in this immediate vicinity is even now gradually going on, but with nothing like the rapidity or favorable conditions which would have resulted had the State granted the prayer of the memorialists to the full extent. In this document we see only the idea of collections and museums, but no hint or suggestion of an institution for the education of young men in the scientific and industrial professions, by means of systematic courses of instruction.

Document No. II contains a new and important step. The memorialists say that "as a further and important means of popular instruction in connection with the general plan, they would look confidently for the establishment, at an early day, of *courses of public lectures*, which, while aiming at a familiar exposition of science and the arts, would exhibit in practical operation by working models, or otherwise, the more important discoveries and inventions as they arise. This feature, though limited at first, as in the well-known Polytechnic Institution of London, to subjects of a purely experimental or demonstrative kind, might be expected soon to extend itself to the fine arts and other branches of liberal culture, and, as a whole, could not fail to add great attractiveness, as well as usefulness, to the general plan. Indeed, considering how greatly the educational value

of museums is augmented by connecting with them an organized system of oral teachings, your memorialists are persuaded that ere long the public liberality would not only provide in this connection for popular lectures on the various branches of industrial science, on the plan of those of Morin, Payen, and other eminent professors of the Conservatoire of Paris, but would establish a comprehensive polytechnic college which, like the Central School of Arts and Manufactures of the same city, or the great Trades Institute of Berlin, would put in practice *a complete system of industrial education* supplementary to the general training of other institutions, and fitted to equip its students with every scientific and technical principle applicable to the leading industrial pursuits of the age."

Here we see the various leading features of the Institute of Technology plainly foreshadowed. But I cannot leave this able and interesting document without making another short quotation, an eloquent statement of the value of the fine arts as an element in any system of education.

"The fourth and last department mentioned in the general scheme, that of the fine arts and education, is too closely associated with the progress of a higher and more humane culture of the community not to claim a place in any extensive educational plan for the public benefit. Your memorialists can add nothing to what has been said so often and so eloquently in proof of the ennobling influences which attend the contemplation of all great works of art. Most of what is true and beautiful in painting, sculpture, or architecture is but the material expression of truth or beauty previously latent in the soul, and must, therefore, awaken in the observer sentiments akin to those from which the artist drew his inspiration. Originating in the purer and subtler elements of our intellectual nature, and calling into play the nicest discrimination of sense, as well as the most delicate moral susceptibility, the cultivation of the fine arts must be regarded as a *necessary* supplement in every wise system of education to the teachings of practical science and the more purely logical exercises of thought. Nor should we, as is sometimes done, regard them too exclusively as merely ornamental portions of the social fabric. If in this connection they may be represented by the wreath of stone that crowns the Corinthian shaft with leafy beauty, while adding nothing to its supporting power, they

are still more truly symbolized by the towering arches and swelling domes, whose very grace and grandeur are conditions inseparable from their strength."

This appeal also failed; but believing that the failure was in part due to the incompleteness and vagueness in which they had presented this feature of their general plan; and finding that in spite of their ill-success an earnest and increasing interest was very generally felt for the establishment of an institution devoted to industrial science and education, the committee determined on taking such steps as were practicable towards the organization, in a preliminary form, of an institution of this character. On May 28, 1860, the general committee appointed a sub-committee, and charged it "with the duty of preparing and reporting a plan of an institution designed for the advancement of the industrial arts and sciences and practical education in the Commonwealth." To this work Professor Rogers devoted the summer of 1860, which resulted in document No. III, "Objects and Plan of an Institute of Technology." This able and comprehensive report, after acceptance by the general committee, was read by Professor Rogers at a public meeting held at the rooms of the Board of Trade, October 5, 1860, and became the lever by which the public, and then the State, was moved during the following year. This document is too familiar to need a single word.

We now come to document No. IV, which contains an account of what I have always regarded as generalship of a high order. It was well known that a large and influential class of citizens, not only of Boston but of various portions of the State, had become deeply interested in the scheme as developed in "Objects and Plan," and the question was how to bring this influence to bear most effectively upon the next legislature. This document details the several steps which were taken to crystallize this general interest into a living and effective organization before it had secured a legal existence.

The next appeal to the legislature was successful, and brings us to document No. V, the charter, and grant of a single, instead of several, squares of land; but granted only on the condition that the increase in value of the lands adjoining the grant should sufficiently appreciate in value to cover its appraised value. This rather sharp bargain on the part of the State was closed the following year by the

repeal of the condition, the legislature thus admitting that the sufficient appreciation had taken place.

We now come to document No. VI, the last, but by no means the least, in importance, entitled "Scope and Plan of the School of Industrial Science of the Massachusetts Institute of Technology," and which might also justly be styled its *intellectual charter*, so closely has it been followed in all essential points to this very day. In this document we see more clearly the breadth, depth, and variety of Professor Rogers's scientific knowledge, and his large experience in college teaching and discipline. It needed just this combination of acquirements and experience to put his conceptions into working shape, to group together those studies and exercises which naturally and properly belong to each professional course, and thus enable others to see the guiding lines which must direct and limit their work in its relations to the demands of other departments.

The experimental element in the instruction of our school—a feature which has been widely recognized as characteristic—is undoubtedly due to the stress and distinctness given to it in the "Scope and Plan." In our discipline we must also give credit to the tact and large-heartedness of Professor Rogers, in the fact that we are entirely free from all petty rules and regulations relating to conduct, free from all antagonism between teachers and students, living in the pure atmosphere of mutual regard and esteem, and securing from pupils a devotion to their work and a loyalty to the school as delightful as it is exceptional. Nor is this influence evanescent and perishing. It lives in the life of the man in after years, and becomes a vital element in his character. He has learned to value true manhood, and ends by desiring to live a true life himself. In this way the life and influence of Professor Rogers have become a never-failing and ever-growing spring of private and public beneficence for all generations to come, rendering his name and fame as immortal as the race itself, into whose service his long life, ennobled by its consecration to human welfare and improvement, has now entered.

With these brief references to the documentary evidence of Professor Rogers's work in the founding of the Institute, I pass to an equally brief consideration of his special work in connection with this department, merely noting that the body now known as the

Society of Arts of the Institute constituted, at the beginning, the corporation. It was soon found that this body was too large to perform readily the executive functions of the corporation, and an application to the legislature resulted in limiting the corporation to those who at the time constituted its officers.

Our first meeting was held April 8, 1862, at the rooms of the Board of Trade, and was organized by the choice of the Hon. F. W. Lincoln as chairman and John D. Runkle as secretary.

Professor Rogers presented the act of incorporation and a code of by-laws for adoption; and after the organization an election of officers resulted in the choice of Professor Rogers as the President of the Massachusetts Institute of Technology.

Now let us listen to the report of the first address of President Rogers. On taking the chair, he returned thanks for the honor conferred upon him; and, after briefly referring to the labors and anxieties encountered in the previous stages of the enterprise, spoke of the responsibility which now rested on all to aid in successfully developing the great scheme of practical education and industrial improvement to which they had in a measure become pledged to the community. Should they succeed, as present indications assured them they would, they might well claim the enduring thanks of the State, and of the friends of progress everywhere. He furthermore remarked that, notwithstanding the engrossing interest of public affairs, and the claims of patriotism upon the liberality of our fellow-citizens, he had the satisfaction of being able to announce that the Institute could even now point to prospective contributions equivalent in utility to more than one hundred thousand dollars, partly in the form of a testamentary provision of Ralph Huntington, Esq., of fifty thousand dollars, and partly, on the promise of an annual appropriation of at least three thousand dollars for the educational department of the Institute, from a trust fund, well known for its magnitude, and the trustees of which are distinguished for the beneficence of its application in the direction, and for the advancement and improvement, of public instruction. In addition to the preceding, it is gratifying, the president observed, to announce a contribution of three thousand dollars to the Institute by the executors of the late venerable lady, Miss Sarah P. Townsend.

No one can read the early records of this Society without being

profoundly impressed with the amazing range of President Rogers's knowledge, and the wonderful tact and skill with which he brought it to bear on nearly all the subjects presented. How often, after some important subject had been rather crudely presented by one whose ability consisted in investigation rather than in exposition, has he, by a few master-strokes, exposed its vital points to the light of day.

Your records, from the first organization, April 8, 1862, to the failure of his health in the fall of 1868, show that he recognized to the full the responsibility which he had assumed in accepting the presidency of the Institute. His labors were incessant and unrelaxing. He literally gave his all, his service, and even his feeble health, —made strong only by a will which knew no yielding, save to that power to which all at last must bow. With partially restored health, and nerved by the old will, he returned to the presidency in 1878. But after three more years of loving service, admonished by the gentle warnings of advancing years, he again transferred the burden of care and responsibility to younger hands. Blessed beyond the lot of most men, he was permitted to see with his own eyes the ripe and abundant fruit of the tree which his own hand had planted, and which, for so many years, he had nourished with his heart's blood, without thought or hope of reward save in the blessings of those whom he, in the providence of God, had started with a "God-speed you" along the highway of life.

And now the graduation day of the class of 1882 was approaching. All looked forward to it with uncommon emotion. It was a day which will be forever memorable in the annals of the Institute. The new president was to preside and introduce to the public the candidates for honors well earned by four years of patient, persistent, and successful study. The first president was to honor the occasion by his presence, and grace it by his eloquence. The day opened gloriously and full of promise. At the appointed hour Huntington Hall was filled with an interested and expectant audience. The programme of the day's exercises was closely followed; and, finally, came the moment when all eyes and hearts were lovingly turned to the central figure of the occasion. President Walker arose and said: —

Ladies and Gentlemen,— During the year now closed the Insti-

tute of Technology has sustained a loss which no accession of talent or of zeal, from any source, could make good. Its revered and honored president—the president also of the National Academy of Sciences—has resigned the cares and labors which have come to weigh heavily upon him, and which only his indomitable spirit and chivalric sense of duty have enabled him so long to sustain; but in order to signify his affection and constant devotion to the school which owes so much to him, and of which he has ever been so great a part, he has consented to allow himself to remain professor emeritus of geology and physics, the chair which he occupied in the infancy of the Institute, while yet the tide rose and fell, twice a day, over the spot where we now sit in this hall devoted to science and industrial art. In a high sense Professor Rogers will always remain President of the Institute of Technology. Present or absent, his spirit will preside over it. No man can succeed him in his fame; no man can hope to do more than successfully administer the school which he alone could have created. Founder and father is his title perpetual, by a patent indefeasible.

By a kindly fortune, which we cannot too highly appreciate, we have Professor Rogers with us this morning. He has consented to say a few words of counsel and cheer to these, his former pupils.

Honored sir, in your presence no voice but yours should give the benediction to these young men and women as they step over the threshold of the cloister, out of tutelage, into the world.

After the hearty applause which greeted this felicitous introduction had subsided, Professor Rogers said:—*

The manner in which I have been received, and the words you have uttered, would, even if I were in the vigor of early manhood, affect me so deeply as to make reply difficult. I confess to being an enthusiast on the subject of the Institute, but I am not ashamed of this enthusiasm when I see what it has come to be. It is true that we commenced in a small way, with a few earnest students, in some rooms fitted up in Summer Street, while, as your president has said, the tides rose and fell twice daily where we now are. Our early

* I am indebted to Mr. George W. Blodgett of the class of 1873, M. I. T., for the report of Professor Rogers's last address, as written down from memory on the day after its delivery, and to Mr. H. A. Carson of the class of 1869 for a few suggested changes.

labors with the legislature in behalf of the Institute were sometimes met not only with repulse but with ridicule, yet we were encouraged and sustained by the great interest manifested by many in the enterprise. Formerly a wide separation existed between theory and practice; now in every fabric that is made, in every structure that is reared, they are closely united into one interlocking system,—the practical is based upon the scientific, and the scientific is solidly built upon the practical. You have not been treated here today to anything in the nature of oratorical display; no decorations, no flowers, no music, but you have seen in what careful and painstaking manner these young men and women have been prepared for their future occupations in life. And although the extracts from the theses which have been presented have been unavoidably largely stated in the technical terms of science, yet they have shown a marvelous thoroughness and accuracy, and in some instances are valuable contributions to our knowledge of the subjects of which they treat. What you have seen has been no research under the direction of a tutor and by his assistance, or prepared for display on this occasion, but it has been the ordinary work of the students, built upon the principles they have acquired in the earlier years of their scientific course, and they show how thoroughly they are equipped for the practical industries, either in the laboratory or in the field.

As I stand here today and see what the Institute is, what it has already accomplished, and what it is at present doing, I call to mind the beginnings of science. I remember that one hundred and fifty years ago Stephen Hales published a pamphlet on the subject of illuminating gas, in which he stated that his researches had demonstrated that 128 grains of bituminous coal —

“Bituminous coal,” these were his last words on earth. Here he bent forward, as if consulting some notes on the table before him, then slowly regaining an erect position, threw up his hands, and was translated from the scene of his earthly labors and triumphs to “the tomorrow of death,” where the mysteries of this life are solved, and the disembodied spirit finds unending satisfaction in contemplating the new and still unfathomable mysteries of the infinite future.

And now, beloved president, teacher, and friend, all hail and farewell! May thy loving spirit continue to find peace and happiness in the everlasting embrace of truth and righteousness.

At the close of Dr. Runkle's remarks the president introduced Professor Charles R. Cross.

Professor Cross said: The first physical paper published by Professor Rogers was devoted to a subject which at that time was occupying the thoughts of some of the ablest living scientific men,—the laws and theory of the voltaic battery; and in it, as in every one of his papers, from the earliest of all, "On an Analysis of Oyster Shells," to the latest, we find the same elegance of presentation, simplicity of experimental methods, and modesty of expression. The authors—for the name of Henry D. Rogers also appears joined to that of his brother—after describing some interesting and, at the time, novel effects, finally "dismiss the subject," to quote their words, "hoping that some gifted individual, Faraday perhaps, in following up his present brilliant discoveries in electricity, may penetrate the obscurity which now conceals the internal movements of this mighty and wonderful instrument."

And most unfortunately for the progress of physics in this country, though happily for its sister science, the course of events drew Professor Rogers into the field of geology in which his greatest triumphs as an investigator were won, and no purely physical original research again appeared from him for a long while, although a few physico-chemical papers, mostly relating with more or less directness to geological questions, were published.

After a considerable period, during which his name had become well known to learned men throughout both our own and foreign countries, he returned to his first love, and in 1855-56 we find him discussing, in a most interesting manner, the subject of binocular vision, a topic which, owing to the invention of the stereoscope by Brewster, improved by Wheatstone, together with the researches of Dove, was then attracting the attention of investigators abroad. He analyzed and explained a number of curious and interesting phenomena of binocular vision, and, as in all his experiments, made the most wonderfully simple apparatus serve his purpose in the investigation of new and unexplained phenomena. Much of this apparatus is preserved by the department of physics of the Institute among the most valued possessions.

A paper discussing the phenomena of smoke-rings and rotating rings in liquids—a subject recently developed by Helmholtz and

Sir William Thomson — appeared in *Silliman's Journal*, for 1858, and in the same year an ingenious research on the properties of sonorous flames was communicated to the Warren Club (as it was then called) of this city, and was soon after published in *Silliman's Journal*. In the course of this research he showed the fallacy of certain ideas that had been up to that time generally entertained, and anticipated Count Schafgottsch in the invention of a beautiful optical proof of the discontinuity of the singing hydrogen flame.

The last original scientific paper bearing his name that was formally published is, so far as appears from the catalogue of the Royal Society, an "Account of Apparatus and Processes for Chemical and Photometrical Testing of Illuminating Gas," which appeared in the British Association report for 1864, it having been presented at the annual meeting of that body.

Yet, while this seems to have been his last formal paper (with the exception, perhaps, of some very recent fragments and his "Eulogy of Professor Henry," presented to the National Academy of Sciences, of which he was president), all who attended the early meetings of the Society of Arts up to the time when failing health obliged him to seek relaxation from some of his public duties know that had his fortnightly remarks been formally printed, applied science would have been a great gainer thereby.

I ought not to omit to mention in this connection as one among his many useful and laborious works an earlier one,— the preparation of a text-book for the use of the students of the University of Virginia, "The Elements of Mechanical Philosophy," a book long out of print, but far superior to any other elementary work on the subject that I have ever seen, in the lucid explanations which are given, and the distinctness with which the leading principles of the science are enunciated, reminding one of the best style of Dr. Thomas Young. The work is marked throughout by that felicity of diction which characterized his every effort, whether spoken or written, even up to the last unfinished sentence which fell from his lips.

But no idea of the magnitude and value of the labors of Professor Rogers in any of the numerous fields of his activity can be gathered from a mere enumeration of his published papers. Did we think thus, we should overlook the greatest works of his life. For while he possessed a complete mastery of those processes of inves-

tigation which were known to the generation with which he grew up, he saw most clearly that science has a duty as well as a privilege; that while it is her noble privilege to search for truth, even the most abstract truth, whenever and wherever it may be found, yet it is her duty—or perhaps, as he would have said, her higher privilege—to so diffuse the knowledge which she has attained that the human race as a whole, even to the poorest and meanest of its members, shall be benefited thereby. He recognized the fact, too often forgotten by scientist and artisan alike, that neither pure investigation nor empirical practice alone can suffice to give the best outcome of scientific work. The knowledge that is not diffused becomes stagnant, and ceases to be a source of intellectual health. And so, while understanding and appreciating the works of a Hamilton inventing a new calculus, a Fresnel untwisting the complexities of a group of light waves, or a Faraday investigating the complex distribution of lines of magnetic force, we find him equally interested in the economical distribution of steam heat, or the improvement of the gas engine. Indeed, I think that the last scientific address ever made by him was one relating the probable advantages to be derived from the general introduction of water gas.

This desire, that the truths of science should be universally diffused and find an application in the useful arts, led him to throw his energy into various practical undertakings. Among these was one of particular importance at the time. When the laws regulating the manufacture of coal gas in this State first went into operation, he was the first State inspector of gas, and by his scientific knowledge and practical skill he made the value of such work apparent to all.

And this same spirit led him to his crowning work in the establishment of this Institute, a work whose details have already been sketched by another and abler hand, so that I need only allude to it. I must, however, call attention to one important and, to me, especially interesting point. The design of laboratory teaching in physics to large classes was original with Professor Rogers. Laboratories for physical research there had been,—laboratories in which a few advanced students might work out new problems; but until he suggested the plan no one seems to have thought it possible to teach the use of physical instruments and physical measurement in that way to a large body of students pursuing a regular course of professional

training. And though to another was confided the actual work of first proving by experiment the practical value of this instruction, his was the far-seeing mind that perceived in advance both the possibility and the great value of such teaching in physics as the Institute was, I believe, the first in the world to give.

His delight in expounding the truths of science waxed rather than waned with his increasing years; and during the years when the state of his health rendered it imperative that no regular teaching should be done by him we still find him fortnight after fortnight, through each successive winter, guiding and inspiring the scientific and literary association of gentlemen of which he was so long the honored and beloved president; and doing quietly here a work broader and deeper because of its very retirement from publicity,—a work whose benefit has been greatly, though indirectly, felt in various ways by many who never even knew of the existence of the organization.

One of the characteristics that always impressed me very deeply in Professor Rogers was the intense enjoyment with which he witnessed any new experiment or any elegant and striking illustration of a physical principle. It was delightful to see the enthusiasm which he felt over the simplest fact of nature when presented in a new aspect. He always showed that freshness of appreciation which too often dies as experience grows deeper, and combined the wisdom of the sage with the enthusiastic appreciation of the child.

It was the intensity of his enjoyment of the laws of nature, and the methods by which these are ascertained, that, added to his unequalled clearness, made a mere description of apparatus or experiment from his lips more valuable than the actual exhibition of the apparatus or performance of the experiment by another. I can never forget the last time I heard him speak upon a scientific theme. He was explaining in a familiar way a new method of determining the mean density of the earth. His explanation of the subject was directed to gentlemen mostly not professed students of science; and in the hands of most teachers such a subject, described from black-board drawings alone, and with no apparatus or experiment to catch the eye and mind, would have been dull and heavy. But his delicate appreciation of the beauty of the direct and simple process which he was describing was so impressed upon every word and gesture that

no one could fail to understand the value both of the process and results.

And, finally, I think that all who knew Professor Rogers have most profoundly felt that greater than any of his works was the man himself. Often a great author or investigator will seem dwarfed, as it were, in comparison with the results of his labors. Not so with him. The intellect was broad as well as profound. His thoroughly developed mind found no subject touching nature or humanity which failed to interest him. Nor was this all. For still less than his intellectual abilities can we forget his moral earnestness, his love of truth, his scorn of everything ungenerous, mean, or unmanly.

To those whose privilege it was to know him, as all his pupils and colleagues knew him, in more intimate personal relations, what tender memories arise! Noble in all his thoughts, unselfish in every action, kindly alike whether he had to praise or to blame, cheerful when circumstances were depressing, hopeful even when the immediate present was perplexing, sympathetic and appreciative,—in short, all that a friend ought to be or can be,—such to us all was he whom we mourn.

THE PRESIDENT: Ladies and Gentlemen,—It is our peculiar good fortune this evening to have with us a gentleman who, though coming from a distant State, is known to all of us by his great work in the Appalachian range, where Professor Rogers first won his world-wide reputation as a geologist. This gentleman, a co-laborer with Professor Rogers, has come from Virginia to offer a tribute, at this meeting, to his memory. I have the great pleasure of introducing to you Major Jedediah Hotchkiss, of Virginia.

Major HOTCHKISS said: Mr. President, Ladies and Gentlemen,—I must apologize for appearing before you simply to talk of my friend and of your friend. I have no formal address to give you, but have trusted the inspiration of this hour and these surroundings to recall memories, and suggest words, befitting this occasion.

A familiarity, lasting during the life of a generation, with Professor Rogers and with his work, one intensified by correspondence and visits from him, was mine. In fact, sir, it was but a few days before his, to us, untimely death that he was beneath my roof, in the famed valley of the Shenandoah, beyond the Blue Mountains of Virginia, that he loved so well, whither he had come to talk over, in his

earnest and enlightening way, the old but never wearying story of his geological work and discoveries in Virginia, to see and rejoice in the prosperity of that great State, and note the development of the vast mineral resources which he had seen, but in vision only, when, nearly half a century ago, he was the director of a geological survey, one of the first made in the United States, of the more than sixty thousand square miles of territory now included in Virginia and West Virginia. All these lead me to desire to contribute my tokens of remembrance and of respect to this meeting called to honor his memory.

The addresses, to which I have had the very great pleasure of listening this evening, give to me, for the first time, information of the exact period of the birth and organization of this now well and widely known institution for technical education, and of the characteristic labors of Professor Rogers in that work. It is strange that in the midst of the storms of civil war such an institution should have been born and organized; and it is equally strange that to the civil convulsions of the Old World we owe the fact that Professor Rogers was one of us. His father was a Scotch-Irishman, a disciple of the gifted but unfortunate Emmet. The leader in arrest, and on trial for his life, his followers sought safety in flight, and Patrick Kerr Rogers found a refuge in our land of freedom of opinions, and here became a Scotch-Irish teacher, one of that fervid and indomitable race of instructors that, in so many ways, has helped to build up, even from the very first, and much more than is generally conceded, this great country of ours.

Patrick Kerr Rogers, from all we can hear of him, was a learned and well-trained man, probably a graduate of the great University of Edinburg, at that time one of the leading scientific schools of the world. He brought his science and his training with him, and, naturally we may almost say, sought Philadelphia, the birth-place of scientific research on this continent, and then the home of our ablest scientists of all classes. There he opened and taught a school in which instruction in the natural sciences formed a leading feature; and there was born, among other sons well-known to fame, William Barton Rogers. Thus it was ordered that from infancy our friend should become familiar with the objects and teachings of natural science, for that most engaged the attention of his father,—a most

fond and devoted parent, as I know from the remembrances of a friend and neighbor of mine, still living, who was his pupil,—so that by a process of absorption as it were, and from the very necessities of his surroundings, that son, even before he attained his majority, was fitted for and became a skillful teacher of natural science.

Before young William's education was completed, his father, whose reputation as a teacher had in a few years become national, was called to assume the chair of natural philosophy and mathematics in the College of William and Mary, in Virginia, the second in age among the colleges of the United States, an institution of learning that not only in its name, but also in all its traditions, recalled the memories and principles of the House of Orange. The "humanities" were the educators at William and Mary when the Scotch-Irish professor entered upon the duties of his chair; but under his teaching natural philosophy, the natural science of that day, soon became a training, observing, and thought-awakening power. Most of his pupils are dead; but some survive, and these remember him as an able and enthusiastic teacher.

At William and Mary, under the wise training of his father and the other distinguished professors then occupying the chairs of that venerable college, having for fellow students those that were soon to become the leading men of Virginia, and where at every step the organic remains of former ages arrest the attention and provoke to thought and enquiry, there William Barton Rogers completed his education and became a citizen of Virginia. From his Irish-born father he inherited that wealth of language with which we are all so familiar; from that father and his associates he had the best intellectual training of that day in this country; but in addition to these he seems to have been born with the eye of a prophet, and the discernment of a seer in the world of science. He had that inward vision that ran back and forth along the lines of time, and saw and comprehended causes and effects, and by its aid reached conclusions, or suggested them, far in advance of the knowledge of his days, certainly of his early ones.

It is not often the lot of any one man to fill for two generations the position of a scientific teacher, to be recognized for such a length of time as an expounder of science; yet such was the fortune of Professor Rogers. After he had graduated at the College of William

and Mary, at the age of twenty-five, he began a course of lectures upon natural science at the Maryland Institute, at Baltimore. After lecturing there for a year, his father was suddenly called hence. Naturally the mantle of the father fell upon the son; and in the year 1828 he was elected to fill the chair of natural philosophy and of mathematics in the College of William and Mary. That was the year in which Thomas Jefferson had succeeded in establishing and opening to students the great university now known as the University of Virginia, an organization of which your Institute is, in many respects, an outgrowth.

It was a strange connection that our beloved friend had with Thomas Jefferson. Soon after his graduation, his father took him to visit the "Sage of Monticello;"—to that famous home, sought by the scholars of all lands, the seat of unbounded Virginia hospitality, perched on the very crest of the Coast Range of the Atlantic Highlands, on an outlook, high and lifted up, from which the delighted eye wanders eastward over the extended undulations of the Midland plain of Virginia, then westward over the lovely valleys and charming gradations of hill and mountain forms of Piedmont, to where the grand Blue Ridge, the noblest range of our Atlantic border, bounds the horizon's verge and stretches far away, northward and southward, in an almost endless perspective. He found Thomas Jefferson, not the President of the United States, not the great politician, not the famous scholar, but the "Father of the University of Virginia," as he desired himself to be remembered, seated on his portico, glass in hand, looking across the lovely Piedmont valley below and to the westward, watching eagerly the rising of the buildings of the University on the slopes beyond, his sole ambition and desire then being to see them completed and occupied. Then and there William B. Rogers was introduced to Thomas Jefferson. The quick eye of the philosopher instantly saw that no ordinary man was before him. At once he began to question him as to his knowledge of natural science, as to his knowledge of mechanics, as to his knowledge of mathematics; and that done, he turned to the father and spoke to him of the son who had a future full of promise before him. It was there that was conceived within the bosom of William B. Rogers a wonder whether the day might not come when he would have a professorship in that institution. There the seed of desire was sown. The

approving words of Thomas Jefferson begat the notion in the boy that he might become one of the men who should give to the world the teachings that Thomas Jefferson would approve.

But my duty perhaps tonight, sir, is to speak of the early scientific work of Professor Rogers with which I presume most of you are not so familiar as I am.

Fifty years ago there was no such thing as the science of geology. All the records were like mythological stories. The world was without form and void to the observer. The deluge had ascended to the tops of the mountains, and each and every one that looked out upon the world looked upon it as one that had been deluge-swept. One had recorded a few observations here, another there; none had come up even to the first letters of the alphabet of geology. It was a science unknown. Then it was that William B. Rogers, having taken his place as professor of natural philosophy and mathematics at the College of William and Mary, had his attention first arrested by the stratification of the marl beds along the shores of the York and the James, there where the first settlement of the white man was made in America. His attention awakened by this stratification of these recent rocks, we find him at once carefully observing and immediately putting his observations before the public. He soon ascertained that these tertiary marls were rich in fertilizing elements that ought to be applied to the fields of Tidewater Virginia that had been wanting them so long. Then William B. Rogers offers the results of his observations to the legislature, and publishes a series of letters upon the value of marl as a fertilizer.

The very last paper which he prepared, which was handed to me but two days ago for publication, was upon the discovery of cretaceous beds in this same region. His first work and his last were in the same geological field.

The publication of these papers provoked inquiry throughout the great State of Virginia, that then possessed sixty-six thousand square miles of territory, stretching from the Atlantic to the Ohio.

Next we find Professor Rogers going before the legislature of Virginia, and there, in the prime of his youth, giving to that body one of those characteristic addresses, such as in after years made him famous, stating what he had discovered, and giving results that we find verified in the geological surveys of today. Professor Rogers

was then professor at the College of William and Mary, but soon his scientific reputation brought about his election as professor of natural philosophy in the University of Virginia; and so his first great wish was realized. An earnest desire for information concerning the structure and mineral resources of the State, stimulated by the eloquent presentation in public, by Professor Rogers, of the few facts concerning these already known, led at once to a reconnoissance by him by State authority. That single season of 1835 spent in looking over the great State resulted in a report so full of discoveries, so full of valuable information, that a detailed geological and mineralogical survey was ordered and provided for by the legislature, and William B. Rogers became the State Geologist of Virginia, and began the researches that laid broadly and enduringly the foundations not only of Virginian but at the same time of American geology, and those of his own lasting fame.

Time forbids that I should enter into a sketch of the geology of that time. Indeed, it will suffice to say there was none; no one had even discovered the order of the rocks. Then it was that, as soon as his appointment was made, Professor Rogers started out to cross the entire width of the State, a distance of nearly four hundred miles, to carefully study and investigate its soils, its minerals, its rocks. We find him first,—for the journey is a familiar one; we have gone over much of it together, and we have talked about it many times,—after giving a passing, but even then an intelligent, glance at the old rocks (the metamorphic of that day) of Midland and Piedmont, and recalling his previous studies in the tertiary of Tidewater, pausing upon the crest of the Blue Ridge, the uplifted western border of the primal continent, and gazing inquiringly westward across the Great Valley, with its parallel lines of northeast-southwest trending hills, to the equally parallel and like trending grand mountain ranges of Appalachia. This first reflective view no doubt suggested what afterwards became a settled conviction, that these rigid waves of mountains and valleys were the outcome of the filling and breaking up of a former westward-extending ocean.

As he went farther he soon discovered that these great rock-based waves had a continuity in all their convolutions and involutions until at last, having reached the border of the great carboniferous plateau, the border of bituminous coal, he saw, in its long westward decline,

where the ocean had once stretched onward to the far West across the broad valley of the Mississippi. Having confidence in his opinions, he put that first observation on paper, and gave it to the world. There it stands today, the record of the first broad reading of American geology that was ever done; and, today, after hundreds have become famous in American geology, that is good reading still. It will remain so. Having discovered the border of this ocean in which the rock-beds now exposed in the mountains and valleys had been originally and successively deposited, he soon discovered the sequence of these rocks, and then, with that simplicity which characterized whatever he did he at once proceeded to group them in numbered formations as in orderly succession they presented themselves to his view.

In his very first report he discouraged naming anything in this country by a repetition of the names used in Europe. He says: "No one has sufficient information to warrant the application of any known geological terms to the rocks of this country; afterwards, when we know more, we may venture to see wherein our rocks resemble those of Europe;" and until that was done he simply proceeded to number them one, two, three, four, five, up to sixteen; and for all subsequent observations he simply divided the American geological column, all of which he found in Virginia, into sixteen subdivisions. It was but five years ago that the geologists of West Virginia discovered that there was a Permian formation in that State, this side of the Mississippi, the boundaries of which they marked out. What was it? It was simply the number xvi of the first explorations of Professor Rogers. But not contented with that, he proceeded, and, in a work that continued through the years 1835, 1836, 1837, 1838, 1839, 1840, in which he spent for the State of Virginia in all about forty-five thousand dollars, he extended dozens of lines of sections across that State from one border to the other; and there is nothing in American geology that has yet been published that is better than those sections are today. It was but two days ago that I first had the pleasure of unrolling and seeing all these and of looking at them in the light of our present knowledge: I do not hesitate to say that, when they shall be given to the world, they will throw light upon problems that such students as Thomas Sterry Hunt are now discussing. We hope they will soon be before the world, that it may judge the man by these early-appearing geological volumes.

We all regret that a man who filled so large a place in the world of science should have left behind him so little embodied in printed language for us to refer to and read and read again. Even his dry annual reports to the legislature of the State of Virginia are today delightful reading. In them he always looks forward in vision to the time when her hills, filled with rich ores, should contribute their share to the wealth of the world. I well remember how delighted he was on coming down to Virginia, where I had the pleasure of accompanying him across the State, when he found realized many of these anticipations. It was with real joy that he looked upon the great furnaces now daily turning out their hundreds of tons of iron from ores that once he saw in vision beneath the surface. It was a delight to see that boyish step and ardent smile when he saw the grand developments that had taken place, and to hear him recall his first visit to that spot, and what he had mentally seen there, that was now laid bare by the hand of industry, so that any man could see it.

Professor Rogers, as the gentlemen that have preceded me have said, had a way of inspiring all that came within the reach of his magic eye. The sound of his wonderful voice gave a charm to whatever he said. All over the State of Virginia even now you will continually meet people in the country, old men and old women, who recollect the days when Professor Rogers drove up with his gig, with Levi, his negro servant, behind him on horseback, accompanying him in his geological rambles,—recollect with pleasure that familiar lecture in the morning from the doorstep; for he never went away without leaving with each one that he visited a new vision of that which before they had seen with sealed eyes that it was his delight to unseal. One of the best of our living structural geologists, one of that same Scotch-Irish race, when a flaxen-haired boy, heard Professor Rogers describe to a group of listeners one of the grand arches of one of Virginia's mountain ranges, when, stooping down, like another great teacher, he wrote its structure in the sand, but wrote for all time. The boy never forgot the graphic rock story, and today Professor Campbell of Washington and Lee University remembers as an inspiration to research and study that lesson there taught by the wayside. How often do the gifted and the learned forget that a word given in season is "like apples of gold in pictures of silver." Let them remember that teaching spirit, and forget not to scatter by the

wayside the seeds of the knowledge they hold in blessed possession but as a trust for the common good.

It would furnish material for a singular study,—that primal geological circle. Levi, the negro serving-man, was in it. He became a geologist. He learned to think as his master thought; and when the great French geologist, Daubeny, came to visit Professor Rogers, the Frenchman was not up to riding horseback, so he took a seat in the gig, and Levi drove him, and as they rode through the grand sections of Appalachian structure there displayed, Levi gave him lessons in American geology. “Dis, sar,” said he, “we call number one. Mighty fine *crap* (out-crop) ob it ’long here.” He had so well learned the lesson from the great master of American geology, he could teach it to the one of French.

Hundreds of note books, that for many years have been stored away in the modest mansion on Marlboro Street, will soon have their embodied results published; then you will have a better conception of this man that in his youth, scarce turned of thirty, solved the geological problems that, with meagre results, if any, had engaged the thoughts of many men of many lands, and of many travellers that had passed over and along the boldly-written story of the earth’s structure, but had never seen or read it.

And how delighted were his great classes in the University of Virginia with his wonderful interpretations of that story! His classroom was crowded with students, for Jefferson had a rare way of treating professors; his notion was that every man should have all he could earn; and so the man that taught most interestingly had the largest classes, and received the largest rewards, for the professor received not only compensation from the State but all the fees from those attending his lectures. Professor Rogers’s class-room was filled not only with students but with many gathered from the people, who came to hear the wondrous story of science which he imparted so clearly that a man who knew not even the alphabet went away feeling that he understood the whole subject.

Time forbids that I should further speak of Professor Rogers. Today the United States government is engaged, for the first time, in a great geological survey that is to extend over all the States. The surveyors are now upon the mountains of Virginia. When they shall have measured all over that broad area, and determined its highest

altitude, but adding nothing of moment to the great sections that William B. Rogers made, that highest summit in the grand Appalachian ranges is to be called Mount ROGERS.

The PRESIDENT: This meeting is now adjourned.

The following letters from two former pupils of Professor Rogers were received by Dr. Runkle in reply to a request made by him for information upon some points, and this was to have been incorporated in his address; but as the letters were not received in season for such use, they have been made, in their original form, part of the records of the meeting. The first is from Prof. Wm. LeRoy Brown, President of the Agricultural and Mechanical College of Alabama; the second, from Prof. Francis H. Smith, Professor Rogers's successor in the Chair of Physics at the University of Virginia.

AGRICULTURAL AND MECHANICAL COLLEGE,
AUBURN, ALA., Oct. 3, 1882.

DR. J. D. RUNKLE:

My dear sir,—In reply to your letter asking me to give my recollection of the impression made on the Virginia students by Dr. W. B. Rogers, when professor at the State University, I beg to state that I was a student at the University of Virginia when Dr. Rogers was Professor of Natural Philosophy, and had the privilege of attending his lectures on physics and astronomy. I remember well the very great interest in and enthusiasm for science he excited among the students by his brilliant lectures. Often, especially when it was announced that he would begin his lectures on astronomy, have I seen his lecture-hall crowded with students from other departments, including those of law and medicine; indeed, so crowded with young men, eager to hear the eloquent presentation of the subject by the professor whom they so greatly admired, that not even standing-room could be found in the hall. All the aisles would be filled, and even the windows crowded from the outside with eager listeners. In one instance I remember the crowd had assembled long before the hour named for the lecture, and so filled the hall that the professor could only gain admittance through a side entrance leading from the rear of the hall through the apparatus room. These facts show how he was regarded by the students of the University of Virginia.

His manner of presenting the commonest subject in science—clothing his thoughts as he always did with a marvelous fluency and clearness of expression, and beauty of diction unsurpassed—caused the warmest admiration, and often aroused the excitable nature of southern youth to the exhibition of enthusiastic demonstrations of

approbation. Throughout Virginia, and indeed the entire South, his former students are scattered, who even now regard it as one of the highest privileges of their lives to have attended his lectures.

They were ever ready to exhibit towards him while living their earnest love and admiration, and, on reading the dispatch announcing his death, felt unfeigned sorrow that their great teacher of science was no longer numbered among the living.

Very respectfully,

WM. LEROY BROWN.

Professor Smith writes : —

Professor William Barton Rogers was, in several respects, the most eminent teacher I have ever known.

In the first place, he had that prime requisite of a good teacher, an ample and exact knowledge of the subject taught, extending far beyond the amount conveyed to the pupil. The teacher who tells all he knows has the secret of tediousness, if the French proverb be true. He who knows no more than he has to tell is worse than tedious. He can scarcely fail to mislead by over-statement. There is perpetual temptation, too, to the pretense of greater information than he really has,—a claim which the immature minds before him are only too ready to concede. But he who brings knowledge out of a full and well-ordered store not only presents it in its proper relation to what is kept back but is able, by proper qualifications, to give the truth. The full and accurate knowledge of which we speak cannot be his who is content merely to repeat the statements of others. The real teacher must verify and, if possible, extend his knowledge by original work. He must be an investigator. There are investigators who are no teachers. There is no genuine teacher who is not an investigator. The statements of such an one are living truths, which are the more significant the better the preparation of the hearer to receive them. Such a teacher was Professor Rogers. When he spoke to us of geology, for instance, his facts were as fresh as the mountain breezes, which had so lately fanned him. His descriptions and illustrations had a vivid reality, a felt fidelity to nature, which the memoriter recitations of a closet geologist could never have possessed.

He had, to a remarkable extent, a second indispensable requisite of a good teacher, viz., the ability to identify himself with the state of mind of the beginner in knowledge, and to accompany him step by step through the subject, neither wearying him by needless digression, nor outstripping him by taking steps too long for him. When Professor Rogers was through with his explanation, the duller man in the class would wear a gratified look of intelligence. His expositions were so easy and so satisfactory that not to catch them argued not dullness but culpable inattention. I thought that I remarked in

him on one occasion some natural impatience when a careless hearer applied, after the lecture, for a repetition of what he had lost by his own fault. Mr. Rogers could be patient with feebleness but not with inattention, and rightly so; for at his magic touch intricate subjects seemed gradually to assume orderly simplicity, and dark matters grew to be bright. I recall the enthusiasm with which Professor Courtenay (himself one of the most thorough teachers of his day) spoke of Professor Rogers's treatment of the doctrine of central forces as a masterpiece of simple yet adequate exposition.

The value, to a teacher, of this faculty of being able to "begin at the beginning" appears more clearly when one thinks of the many really able men who do not possess it. Who has not witnessed their painful attempts to convey knowledge? They begin with unintelligible utterances, which seem to cover the subject with gloom. Each new sentence sheds additional darkness on what was already dark. In the countenances of the hearers perplexity deepens into hopeless imbecility, succeeded often by peaceful slumber; while the unfortunate speaker, if he be humble, finally retires with a mortified sense of failure, or, if he be not, often grows desperate and seeks by raising his voice to overcome a difficulty which is really in him and not his audience, and which demands not more sound but more sense.

To this ability to realize the difficulties of the beginner, and to remove them, Professor Rogers added, in the third place, a command of copious and apt language,—a power of easy and eloquent expression as rare as it was delightful. We have all known teachers of extensive learning and of adequate power of adapting themselves to the capacity of their pupils who were yet ungraceful in utterance and displeasing in style. While the reason of the learner might be satisfied under their instruction, his taste was continually offended. Somewhat of his attention was perhaps withdrawn from the excellence of the logic to the faults of the manner. Let it be observed that to secure the highest excellence as a teacher it is not enough merely to avoid such faults. They are mainly due to a lack of imagination, and imagination may and should be a great help to the teacher. A living philosopher has pointed out the importance of the imagination to the scientific investigator. Professor Rogers gave a signal proof of the value of its right use in the highest style of teaching. To his princely imagination was due the aptness of his language,—a single happy epithet often illuminating a whole sentence. He had marvellous skill in the use of adjectives, those dangerous parts of speech which are bad masters but excellent servants. He knew how to use them as a skillful artist uses his colors,—not to daub his canvas, but to make his well-drawn outlines glow with life. He did not disdain an occasional rhetorical ornament when the subject naturally flowered into beauty; but imagination was with him ever the handmaid, not the mistress, of reason. He never fell into that semi-poetical bombast

once known as "American eloquence"; nor, on the other hand, did he discard the right use of the imagination because it is so often abused. His example may profitably be studied by American speakers and teachers who, in recoiling from a ridiculous extravagance of rhetoric, are perhaps in danger of falling into a dry and hard fashion of speech, which may escape absurdity but does not escape poverty.

I am sure injustice is often done to Professor Rogers by his admirers. One may hear grey-haired men in the South tell of his remarkable eloquence and recite passages from his lectures, heard, it may be, thirty or forty years before. They speak of him as an accomplished rhetorician. Such praise falls infinitely below his merit. In their admiration of some striking sally of the imagination, thrown in perhaps in the course of a long lecture, merely to relieve the strain on their unflagging attention, they forget the masterly train of luminous exposition which preceded and followed it, which seemed so easy and yet was so hard to do, as those of them found out who have since tried to imitate it. I have listened to some men of equal scientific acquirements, and to others of equal wealth of fancy, but never to one who equalled him in uniting accurate thought to fit expression. Whether he appeared on the platform of the British Association or upon that of its American namesake,—whether behind the lecturer's desk at Boston or Charlottesville,—his preëminence was at once obvious and acknowledged. I remember the glowing tribute paid him by the late Prof. Bache after hearing him give a lecture in Providence twenty-five years ago. He pronounced it the most perfect specimen of scientific analysis he had ever listened to.

Professor Rogers had another attribute of a great teacher. He never disparaged the work of the teacher. He clearly appreciated its dignity and difficulty. He never thought that a man could know too much or be too great for a teacher. He was well aware that the loftiest powers and the greatest learning have found ample scope in this honorable and responsible calling. He once told me that he never rose to begin a lecture without some feeling of trepidation. He respected even his audience of young students. No wonder he did so much better than the self-complacent and condescending wise men who are often seen in similar places. Finally, Professor Rogers was possessed of great patience and good-nature,—qualities indispensable to the successful teacher, who has to deal with such variety of character and conduct. Bright boys are often wayward, and good boys are sometimes stupid. Professor Rogers could be patient with the dullness of the one, and gently firm with the folly of the other. I knew him for thirty-three years, first as a pupil and then as a friend. I never heard him speak an unkind or uncharitable word. I never knew him to give needless pain to a human creature. This seemed to require in him no self-control. It appeared to be the normal product of a kind and gentle nature. We fondly dwell upon this

charming trait of character. We turn from his splendid intellect to his warm and tender heart. Admiration of his talents melts into love for the man, our humble tribute to the great teacher, which began with applause, fittingly ends in tears.

FRANCIS H. SMITH.

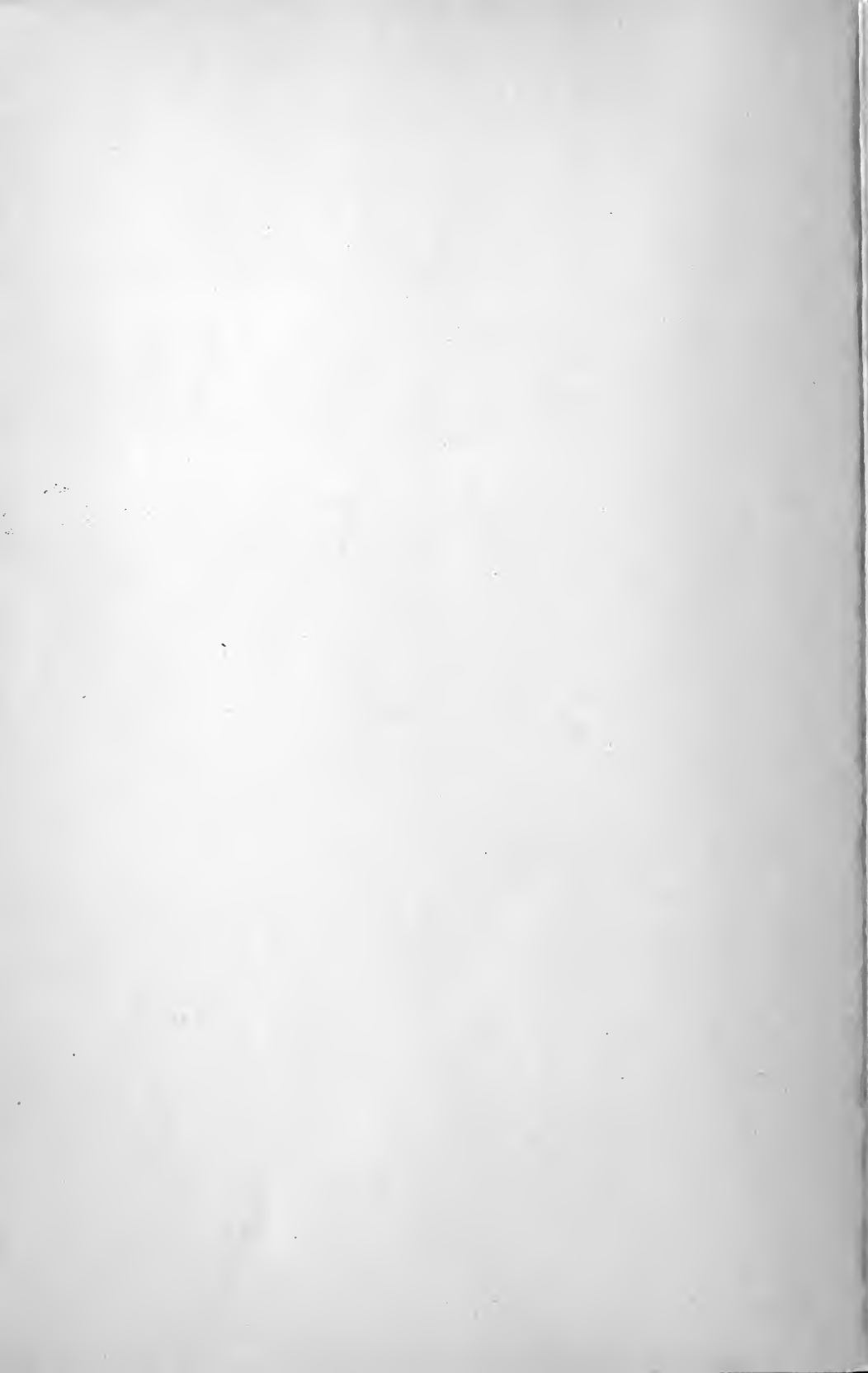
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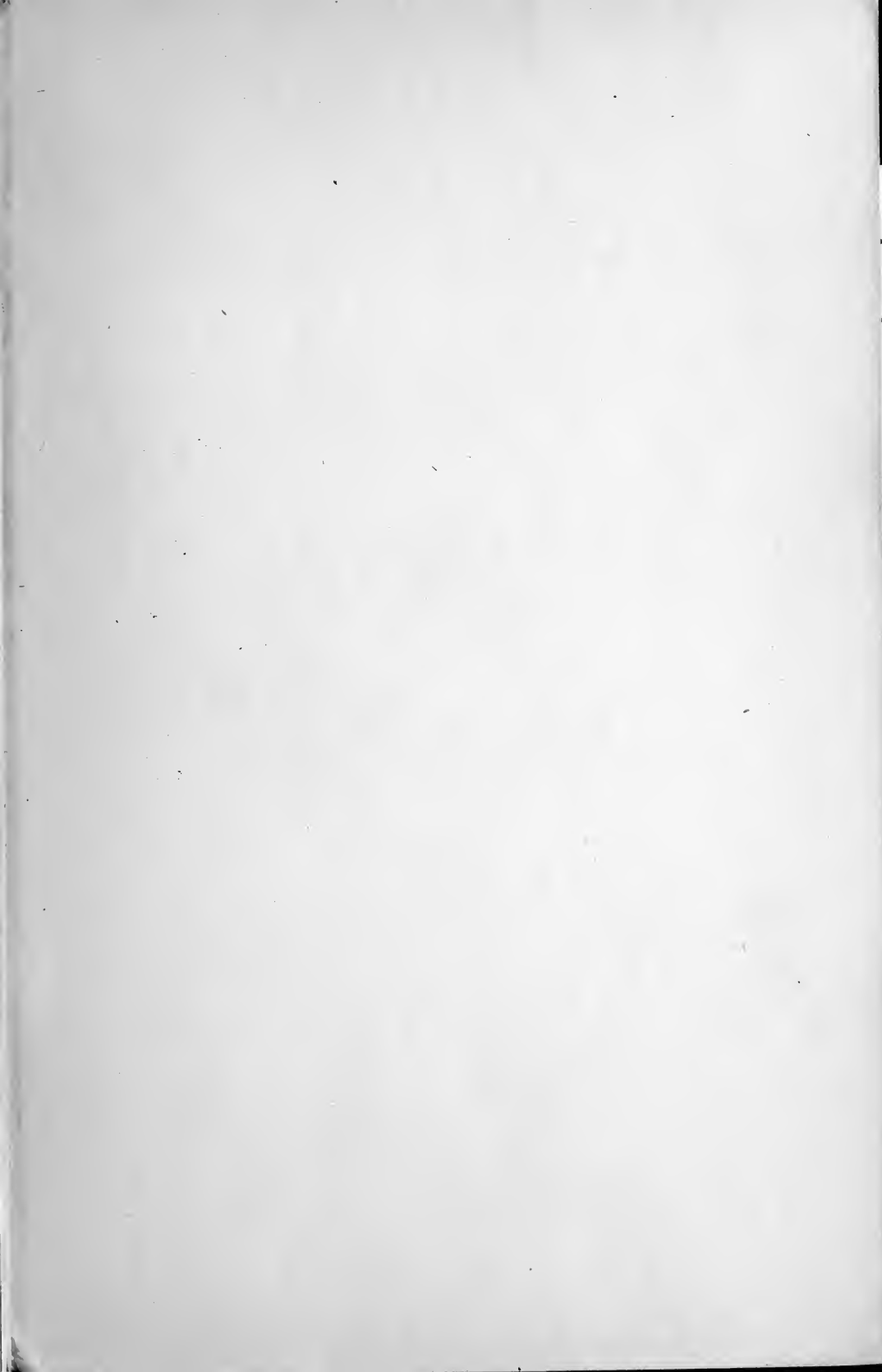
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